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10/501,145	07/13/2004	Lieven Anaf	016782-0310	5358

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EXAMINER	
SCULLY, STEVEN M	

ART UNIT	PAPER NUMBER
1727	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/501,145	ANAF ET AL.	
	Examiner	Art Unit	
	Steven Scully	1727	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *9/20/2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,7-17,20 and 23-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,7-17,20 and 23-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

POROUS METAL STACK FOR FUEL CELLS OR ELECTROLYSERS

Examiner: Scully S.N.: 10/501,145

DETAILED ACTION

1. The Amendment filed September 20, 2010 has been entered. Claims 1 and 4 have been amended, claim 6 is canceled and claims 23-26 are newly added. Accordingly, claims 1, 2, 4, 7-17, 20 and 23-26 are currently pending examination in the application.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Objections

3. Claim objection of claim 6 is withdrawn because the claim has been canceled.

Claim Rejections - 35 USC § 112

4. Claim rejection of claim 4 under 35 U.S.C. 112, first paragraph, is withdrawn because the claim has been amended.

Claim Rejections - 35 USC § 103

5. Claims 1, 2, 4, 6-17, 19, 20 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sounai et al. (US4,554,225) in view of Cisar et al. (US6,562,507).

With respect to claims 1, 13 and 16, Sounai et al. disclose a fuel cell a stack of unit cells, each having a cathode (14) and an anode (15), which each comprising a first porous layer (18) and a second porous layer (19). (Note: first and second porous layers of Sounai are interpreted to be the second and first metal fiber layers of claim 1, respectively.) The first porous layer (18) comprises a sintered body of a fibrous nickel, and has a porosity of 60-80%. The second porous layer comprises a sintered body of a fibrous nickel. See column 4, lines 36-52. Adjacent the electrodes are bipolar plates (12) which are impermeable metal structures that function as bipolar plates. See Figure 1. Sounai et al. disclose the second porous layer to have fibrous metal having a diameter of 25um and further disclose the first porous layer to have fibrous metal having a diameter of 4um. See column 6, lines 5-23. While the second porous layer of Sounai et al. in Example 1 has a porosity of 75%, Sounai et al. disclose the porosity can be 60-80% and it is the position of the Examiner that one would expect an average diameter generally equivalent to that of 75% porosity for variations thereof. Further, absent a showing of unexpected results, it is the position of the Examiner that the equivalent diameters are not critical.

Sounai et al. do not disclose the bipolar plates and the electrodes to be sintered together. Cisar et al. disclose a stack comprising an impermeable metal structure (see claim 1, column 10, lines 44 to 45), one first metal fiber layer and one second metal fiber layer made of sintered metal fibers (see claim 2, column 10, lines 56 to 59), said impermeable metal structure being sintered to one side of said first metal fiber layer (see claim 1, column 10, lines 46 to 47), said second metal fiber layer being sintered to

the other side of said first metal fiber layer (see claim 7). Cisar et al. further disclose that sintering provides full conductivity of the metal to be realized to provide superior performance. See column 6, lines 33-43. It would have been obvious to one of ordinary skill in the art to sinter the conductive materials of Sounai et al. together to provide for full conductivity for superior performance. Sounai et al. disclose the porosity of the second porous layer is 60-80%. A *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough (for example, 80% and >80%) that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). Further, it is the position of the examiner that the specific ranges of the porosity of the first and second metal fiber layers are not critical.

Sounai et al. in view of Cisar et al. do not explicitly disclose the planar air permeability. However, it is the position of the examiner that Sounai et al. disclose metal fiber layers which have the porosities claimed. Air permeability is a function of porosity, pore size and the distribution of the porosity. It is the position of the Examiner that absent any discussion otherwise, one of ordinary skill in the art would expect the porous body of Sounai et al. made in Examples 1 and 2 to have generally even distribution of porosity throughout, as this would be directly related to the diameter and aspect ratio of the fibrous metal used, which are the same fibrous metal throughout each layer. Sounai et al. disclose both small pore sizes and large pore sizes. See Column 6, lines 5-22. Thus, because Sounai et al. disclose metal fiber layers having the porosities as claimed, an even distribution of the porosity and both large and small

pores, it is the position of the examiner that a layer of Sounai et al. would inherently have a planar air permeability of more than 0.02 l/min*cm. Inherency is not established by probabilities or possibilities. *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51.

With respect to claim 2, Sounai et al. disclose a stack of bipolar plates and electrodes, wherein each bipolar plate is directly adjacent two electrodes. See Figure 1.

With respect to claims 4 and 26, Sounai et al. in view of Cisar et al. do not explicitly disclose the perpendicular air permeability of the second metal fiber. However, it is the position of the examiner that for those reasons as discussed above with respect to the planar air permeability of claim 1, the second fiber layer of Sounai et al. in view of Cisar et al. would inherently have a perpendicular air permeability of less than 200 l/min*dm^2. Inherency is not established by probabilities or possibilities. *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51.

With respect to claim 7, Sounai et al. disclose the second porous layer to have a thickness of 0.7mm. See column 4, lines 49-52.

With respect to claim 8, Sounai et al. disclose the electrodes are, for example, 1mm thick. See column 4, lines 36-37. Also, Sounai et al. disclose the ratio of the thickness of the first and second porous layers is about 1.0:3.2. See column 6, lines 41-42. This yields approximately 0.2mm thickness for the first porous layer.

With respect to claim 9, Sounai et al. in view Cisar et al. are silent with regard to said stack having a transversal electric resistance less than 30*10-3 Ohm. Cisar et al. disclose that the component or subassembly provides a metal structure having higher

electrical conductivity than conventional bipolar plates or stack structures (see column 6, lines 18 to 20). It would have been obvious to one of ordinary skill in the art at the time of the invention to reduce the electric resistance in order to achieve higher electrical conductivity in the metal structure. Higher electrical conductivity in the invention can reduce the number of parts in the unit and thus making it lighter in weight.

With respect to claims 10-11, Sounai et al. disclose the bipolar plate (12) to be stainless steel. See column 4, lines 53-54.

With respect to claims 12 and 14, Sounai et al. are silent as to the metal fibers being stainless steel or titanium. Cisar et al. disclose forming gas diffusion layers from nickel, stainless steel, titanium and combinations thereof. See claim 23. It would have been obvious to one of ordinary skill in the art to substitute stainless steel or titanium because one of ordinary skill in the art would have reasonable expectations for the substitution to yield predictable results. *KSR International Co. v. Teleflex Inc. (KSR),* 550 U.S. ___, 82 USPQ2d 1385 (2007).

With respect to claim 15, Sounai et al. in view Cisar et al. disclose a stack as in claim 1, said metal fibers having the same alloy of said impermeable metal structure by combining all three structures into a single unitary metallic part which includes gas distribution structure by sintering, the gas diffusion structure, and the gas barrier structure (see abstract, lines 8 to 11 of Cisar et al.). It would have been obvious to one of ordinary skill in the art to sinter as discussed above with respect to claim 1.

With respect to claim 17, Cisar et al. disclose using electrochemical cells in an electrolyser, and it is well known in the art that stack assemblies can be used in a fuel

cell or an electrolyser, thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use the stacks of claim 1 in an electrolyser.

With respect to claims 19-20, Sounai et al. disclose the first and second porous layers may be each 60-80% porous. Thus, for example, Sounai et al. disclose the second porous layer is 80% porous while the first porous layer is 60% porous.

6. Claims 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sounai et al. (US4,554,225) in view of Cisar et al. (US6,562,507) as applied to claims 1, 2, 4, 6-17, 19, 20 and 26 above, and further in view of Uchida et al. (US2002/0150808).

With respect to claims 23-25, Sounai et al. in view of Cisar et al. do not disclose the porosity of the first metal fiber layer to be more than 82%, 85% or 90%. Uchida et al. disclose an electrode is formed by depositing a catalyst layer on each side of a polymer electrolyte membrane and a gas diffusion layer thereon. See [0002]. The gas diffusion layer is equivalent to the first layer of the present invention (Sounai's second layer 19). Uchida et al. further disclose that an increase in the porosity of the gas diffusion layer improves gas permeability but reduces electrical conductivity. See [0004]. Thus, porosity is a result effective variable. It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the porosity because Uchida et al. teaches it inversely affects gas permeability and electrical conductivity. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

7. Applicant's arguments filed September 20, 2010 have been fully considered but they are not persuasive. Applicant argues:

a) Example 1 of Sounai et al. in view of Cisar et al. do not disclose or suggest the structure of claim 1.

The Examiner respectfully disagrees. Sounai et al. disclose a stack comprising a bipolar plate layer 12, an electrode layer 14 comprising first 18 and second 19 metal fiber layers, an electrolyte 13 and a second electrode layer 15 comprising first 18 and second 19 metal fiber layers, where this structure repeats. See Figures 1 and 2. Referring to the claim, "an impermeable metal structure configured to function as a collector layer or a bipolar plate" is the bipolar plate 12 discussed above. "At least one first metal fiber layer" is the second metal fiber layer 19 discussed above. "At least one second metal fiber layer" is the first metal fiber layer 18 discussed above. This provides the sequence required by the claim. Further, the metal fiber layer 19 which is equivalent to the claimed first metal fiber layer has a pore size to allow capillary action, such as a pore size of 0.3 to 20um and a porosity of 60 to 80%. See column 4, lines 36-52. A pore size such as 2 to 5um, which falls within this range, is formed by fibrous material having the diameter of 4um. See column 6, lines 19-21. Thus a *prima facie* case of obviousness exists as discussed above. The metal fiber layer 18 which is equivalent to the claimed second metal fiber layer has a pore size not to allow capillary action, such as 21 to 50um and a porosity of 60 to 80%. See column 4, lines 36-52. A pore size of 22 to 30um, which falls within this range, has a fibrous material diameter of 25um. See column 6, lines 16-18. Thus a *prima facie* case of obviousness exists as

discussed above. For these reasons and those within the body of the rejection above, it remains the position of the Examiner that the rejection is proper.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Scully whose telephone number is (571)270-5267. The examiner can normally be reached on Monday to Friday 7:30am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571)272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. S./
Examiner, Art Unit 1727

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1727